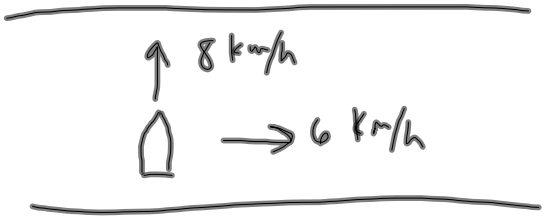
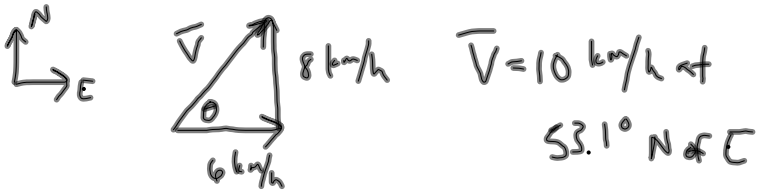
#38:



a)



$\vec{V} = 10$ km/h at 53.1° N of E

$$V^2 = (6\ km/h)^2 + (8\ km/h)^2$$

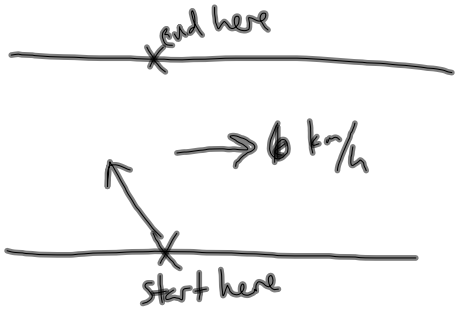
$$V = 10\ km/h$$

$$\tan\theta = \frac{8\ km/h}{6\ km/h}$$

$$\theta = \tan^{-1}\left(\frac{8\ km/h}{6\ km/h}\right)$$

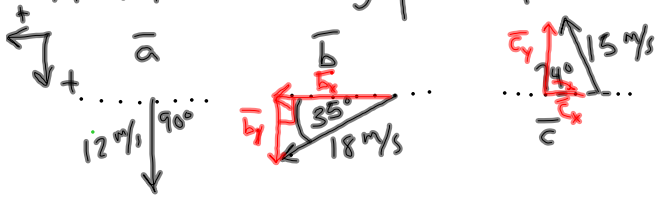
$$= 53.1^\circ$$

b)

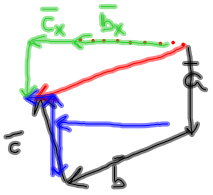


- all must have
  - 6 km/h as their x-component
- this gives many different combinations

Add the vectors graphically and algebraically:



Graphically:



Algebraically:

$a_x = \emptyset$

$b_x = (18\ m/s)\cos(35°) = 14.74\ m/s$

$+\ c_x = (15\ m/s)\cos(74°) = 4.13\ m/s$

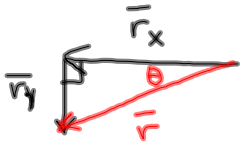
$r_x = 18.87\ m/s$

$a_y = 12\ m/s$

$b_y = (18\ m/s)\sin(35°) = 10.32\ m/s$

$+\ c_y = (15\ m/s)\sin(74°) = -14.41\ m/s$

$r_y = 7.91\ m/s$



$r^2 = r_x^2 + r_y^2$

$r = 20.4\ m/s$

$\tan\theta = \frac{r_y}{r_x}$

$\theta = \tan^{-1}\left(\frac{r_y}{r_x}\right)$

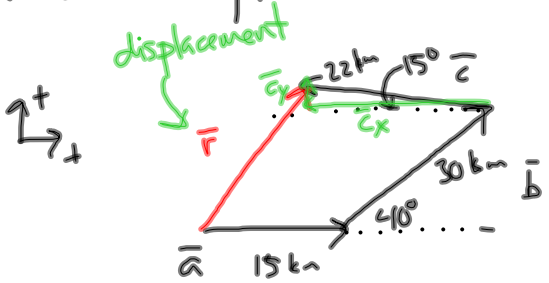
$= 22.8°$

$\vec{r} = 20.4\ m/s\ @\ 22.8°\ S\ of\ W$

Displacement v. Distance:

- Definitions: (change in)
  - Displacement: how far away an object is from where it started
    - * Vector
  - Distance: total amount than an object traveled
    - * Scalar
    - calculate by adding up magnitudes of all displacement vectors

A car travels 15 km to the east, turns and travels 30 km at an angle of 40° north of east, and then travels 22 km at an angle of 15° north of west. Find the car's distance and resultant displacement.



distance = 15 km + 30 km + 22 km

= 67 km

$a_x = 15$ km

$b_x = (30\text{ km})\cos(40°) = 22.98$ km

$+\ c_x = -(22\text{ km})\cos(15°) = -21.25$ km

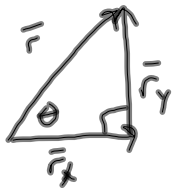
$r_x = 16.73$ km

$a_y = \emptyset$

$b_y = (30\text{ km})\sin(40°) = 19.28$ km

$+\ c_y = (22\text{ km})\sin(15°) = 5.69$ km

$r_y = 24.97$ km



$\bar{r} = 30.04\text{ km} @ 56.8°$ N of E